## CLAIMS

1. Vertical cavity surface emitting laser comprising:

a laser active region (140),

a resonator having a first reflector (110) and a second reflector (130),

the first reflector (110) comprising

a first plurality of doped layers (111) having alternately a low index of refraction and a high index of refraction,

an aperture layer (112) located above said first plurality of doped layers (111) and formed of an insulating material that is substantially non-transparent for a specified wavelength range, the aperture layer (112) having an aperture (113) formed of conductive and optically transparent material with a first characteristic lateral size ($d_{ox}$), and

a second plurality of doped layers (114) having alternately a low index of refraction and a high index of refraction, the second plurality (114) having a second characteristic lateral size ($d_m$), a difference (117) of the first characteristic lateral size ($d_{ox}$) and the second characteristic lateral size ($d_m$) being adapted to generate increased optical losses of said resonator with respect to higher order modes for said specified wavelength range compared to the optical losses caused by said aperture layer alone, and

a radiation output window (150) formed above said first reflector (110) or below said second reflector (130).

2. The vertical cavity surface emitting laser of claim 1, wherein said radiation output window has a third characteristic lateral size that is less than the first and the second characteristic lateral sizes.

3. The vertical cavity surface emitting laser of claim 1 or 2, wherein said radiation output window is formed in a metal layer.

4. The vertical cavity surface emitting laser of any of claims 1 to 3, wherein said first characteristic lateral size is equal to or greater than 5 μm.

5. The vertical cavity surface emitting laser of claim 4, wherein said first characteristic lateral size is equal to or greater than 6 μm.

6. The vertical cavity surface emitting laser of any of claims 1 to 5, wherein an absolute amount of said difference of the first characteristic lateral size and the second characteristic maximum lateral size is in the range of approximately 6 μm.

7. The vertical cavity surface emitting laser of any of claims 1 to 5, wherein an absolute amount of said difference of the first characteristic lateral size and the second characteristic maximum lateral size is in the range of approximately 4 μm.

8. The vertical cavity surface emitting laser of any of claims 2 to 7, wherein said third characteristic lateral size is in the range of approximately 4 to 7 μm.

9. The vertical cavity surface emitting laser of any of claims 1 to 8, further comprising a third plurality of doped layers having alternately a low index of refraction and a high index of refraction, the third plurality of doped layers being disposed between said aperture layer and said second plurality of doped layers and having a characteristic lateral size that is greater than said second characteristic size.

10. The vertical cavity surface emitting laser of any of claims 1 to 9, wherein the number of doped layers in said first plurality is equal to or less than 9.

11. The vertical cavity surface emitting laser of claim 9, wherein the number of doped layers in said third plurality is equal to or less than 9.

12. The vertical cavity surface emitting laser of any of claims 1 to 11, wherein said second reflector comprises a plurality of doped layers having alternately a low index of refraction and a high index of refraction.

13. The vertical cavity surface-emitting laser of claim 12, further comprising a substrate carrying said second reflector on one surface and a metal layer formed on the opposite surface of the substrate.

14. The vertical cavity surface emitting laser of any of claims 1 to 12, further comprising a contact layer formed between said laser active region and at least a portion of said second reflector, said contact layer being configured to electrically connect said active region to a contact pad.

15. The vertical cavity surface emitting laser of any of claims 1 to 14, wherein said first characteristic lateral size is equal to or less than said second characteristic lateral size.

16. The vertical cavity surface emitting laser of any of claims 1 to 14, wherein said first characteristic lateral size is greater than said second characteristic lateral size.

17. The vertical cavity surface emitting laser of any of claims 1 to 17, further comprising a phase matching layer formed within said resonator, the phase matching being configured to shape the transverse reflectivity of said resonator so as to suppress higher transverse radiation modes.

18. The vertical cavity surface emitting laser of claim 18, wherein said phase matching layer is provided above said second plurality of doped layers.

19. The vertical cavity surface emitting laser of any of claims 1 to 19, wherein said aperture and said second plurality of doped layers have a substantially circular shape and said first and second characteristic lateral sizes represent a first diameter and a second diameter, respectively.

20. The vertical cavity surface emitting laser of claim 20, wherein said radiation output window has a substantially circular shape.

21. The vertical cavity surface emitting laser of any of claims 1 to 19, wherein at least one of said aperture and said second plurality of doped layers has a non-circular shape to provide different optical losses for different polarization states of a low-order radiation mode of said specified wavelength range.

22. The vertical cavity surface emitting laser of any of claims 20 or 22, wherein said radiation output window has a non-circular shape to provide different optical losses for different polarization states of a low-order radiation mode of said specified wavelength range.

23. A method of forming a vertical cavity surface emitting laser, the method comprising:

selecting a target output wavelength range,

selecting appropriate semiconductive materials for a laser active region and a first and second reflector, wherein the first reflector includes a first plurality of doped layers and a second plurality of doped layers with an aperture layer arranged therebetween,

determining a minimum acceptable lateral size of an aperture formed in said aperture layer,

correlating at least two of the following characteristic dimensions of the vertical cavity surface emitting laser, a first characteristic lateral size representing a lateral extension of said aperture, a second characteristic lateral size representing a lateral extension of said second plurality of doped layers, a third characteristic lateral size representing a lateral size of a radiation output window, a vertical distance between said laser active region and said aperture layer and a vertical distance between said aperture layer and said second plurality of doped layers, so as to increase optical losses of higher radiation modes than are obtained with said minimum acceptable lateral size alone, wherein said first characteristic lateral size is equal to or higher than said minimum acceptable lateral size, and

forming said laser active region, said first and second reflectors and said radiation output window according to dimensions determined during said correlating step.

24. The method of claim 24, wherein said minimum acceptable lateral size is selected so as to maintain a current density below a critical threshold for an output power of 1 mWatt and more.

25. The method of claim 25, wherein said minimum acceptable lateral size is 5µm or more.

26. The method of claim 25, wherein said minimum acceptable lateral size is 6µm or more.

27. The method of any of claims 24 to 27, wherein correlating at least two characteristic dimensions includes:

varying one or more of the characteristic dimensions while keeping at least one characteristic dimension constant, and

determining at least one of an output power and an output wavelength for a specified operating range.

28. The method of claim 24, wherein correlating at least two characteristic dimensions includes calculating an optical field within said resonator for a plurality of value combinations and determining a design value range for at least one of the at least two characteristic dimensions for at least one of a desired output power and a spectral purity.

29. The method of claim 24, further comprising specifying process margins for said at least two characteristic dimensions on the basis of said correlation.